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(54) **PSEUDO-BACKGROUNDNOISE GENERATING METHOD**

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a pseudo-backgroundnoise generating method which generates a pseudo-backgroundnoise giving no feeling of physical disorder to a listener irrelevantly to intermittently sent backgroundnoise information.
SOLUTION: By the pseudo-backgroundnoise generating method at the time of no telephone call through a moving object communication devicepseudo- backgroundnoise is generated on a base station side on the basis of received encoded energyan encoded reflection coefficient which is calculated by a reflection coefficient calculation part 11 and smoothedand the residual code of white noise stored in a memory of a residual code file readout part 12.

CLAIMS

[Claim(s)]
[Claim 1]A false background-noise generation method generating a false background-noise signal in a base station side based on a received coding energy valuea coding reflection coefficient valueand remainder numerals of white noise established beforehand in a false background-noise generation method at the time of no talking over the telephone in a mobile transmitter.
[Claim 2]A false background-noise generation methodwherein it stores remainder numerals of white noise beforehand as a fileand they repeat remainder numerals of this stored white noise successivelyread them during silent and generate a false background-noise signal in the false background-noise generation method according to claim 1.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the generation method of a false background noise when controlling the transmission output of speech information to an OFF state in the silent interval under telephone call more particularly about the generation method of the false background noise inserted in the silent interval under telephone call used in a mobile transmitter in order to reduce the amount of used electricity of a mobile station.
[0002]
[Description of the Prior Art]In order to lengthen the life of the cell in the mobile station (personal digital assistant) of a mobile transmitterthe voice signal transmission method called what is called VOX (Voice Operated Transmitter) control is known.
[0003]In VOX controla mobile station will announce beforehand voice signal output OFF of the following frame by transmitting a postamble signal (it is hereafter described also as a POST signal)if a non-sound is detected during a telephone call. If an owner sound is detected in said silent statetransmission output one of an audio signal will be announced beforehand by transmitting a preamble signal (it is hereafter described also as a PRE signal).
[0004]On the other handduring the silent intervalin order to enable generating of a false background noise by a base station sidein the POST signalthe information on a mobile station background noise is included. The information on the mobile station background noise included in the POST signal makes the mobile station background noise the signal coded according to the usual voice coding regulation (standard regulation of Research & Development Center for Radio System). The mobile station is enabling during silent renewal of the false background noise which makes it generate in a base station side by transmitting a POST signal to a periodic target (it is 1 time in [maximum cycle] 1 second).
[0005]In the case of said maximum cyclethe mobile station in a silent period transmits the information on a background noise only once in 1 second. Thenif speech information shall be transmitted 50 times in 1 second during the owner soundin a base stationthe information on a background noise will be acquired only once in 1 second during a silent periodbut this amount of information will hit only the information for 2% of the speech information in an owner sound period. Howeverit is impossible to reproduce a actual background noise for 2% of this information. Soin a base stationa false background noise must be inserted using the information for these 2%.
[0006]From the point of being easy to hear it about the false background noise insertedto fulfill the point of following (a) - (c) is desired to a false background noise.
[0007]a) A false background noise must not be jarring for an addressee.
[0008]b) Be smoothly updated in the time of entering from an owner sound period in a silent periodand the case of the renewal of a false background noise of each cycle in the same silent period.
[0009]c) There needs to be no difference in the tone quality of the false background noise generated to each cycle in the same silent period not much.
[0010]In mobile communicationsbased on standard regulation of said Research & Development Center for Radio SystemVSELP numerals (vector-sum excitation

(remainder) linear prediction numerals (Vector-Sum Excited Linear Predictive Coding)) code the digital sound signal which PCM-ized the analog voice signaland it is transmitted. In order [this] to carry out VSELP codingbased on a digital sound signalit calculates and the calculated parameter is quantizedand a quantized value and a corresponding symbolic language are arranged in an order based on said regulationand the parameter of frame energy and a reflection coefficient forms a transmission codeand is transmitted. In this caseif it sees about a reflection coefficientthe parameter of a reflection coefficient will be a value between -1 -and the parameter of a reflection coefficient will be quantized with reference to the quantization table where this value was defined by said regulation. The frame energy parameter calculated also about frame energy is quantized. This specification is described as the reflection coefficient value (or front [coding] reflection coefficient value) before coding the quantized value of the parameter of a reflection coefficientIt is described as the frame energy value (or coding frame energy value) which it was described [value] as the quantized value of a reflection coefficientand the reflection coefficient value (coding reflection coefficient value) which had the corresponding symbolic language codedand had the symbolic language corresponding to the value of the quantized frame energy parameter coded. It explains as what the background-noise information containing the frame energy value coded in this specification and the coded reflection coefficient value contains in a postamble signal.
[0011]The method indicated to JP5-122165A is known concerning insertion of the background noise in a silent interval. It seems that the composition of the transmitting side of a mobile station and a receiver to which this method is applied is shown in drawing 9 (a) and (b). In the transmitting side shown in drawing 9 (a)when a sound changes from an owner sound to a non-sounda postamble signal is sent to the transmission section 47 via the data switching section 47 from the postamble generating part 45. The frame power (frame energy value) with which the sound outputted from the highly efficient voice coding machine 42 following the postamble signal sent out from the data switching section 47 to a transmission section was codeda prediction coefficient (a reflection coefficient is the numerals processed since a prediction coefficient was sent out to a post process)etc. are sent out.
[0012]In the receiver shown in drawing 9 (b)the background-noise information containing the coding frame power of the sound for background noises transmitted from the highly efficient voice coding machine 42 of the transmitting side in a silent interval and a prediction coefficient is incorporated into the storage parts store 63and is memorized. After this background-noise information is read from the storage parts store 63with the residual signal generated from the random remainder generating part 64it is inputted into the background-noise synchronizer 65is compounded thereand generates a background noise.
[0013]
[Problem(s) to be Solved by the Invention]Howeverin the above-mentioned conventional mobile transmitterthe method of generating a false background noise is unknown about whether the noise which is easy to hear is generatedin order that the transmitting side and a receiver may compound the background-noise information from a highly efficient voice coding machine with the remainder random as it is.
[0014]As for the reasonin order that an audio frame energy value may determine an audio sound pressure level and a reflection coefficient value may determine audio height

(frequency)based on thesethe sound pressure level and height of a false background noise are decided. Howeversince the background-noise information in a silent interval is transmitted only once in a maximum of 1 secondthe size of a false background noise and dispersion of frequency which are generated for every reception when dispersion between frame energies and between prediction coefficients is large are also large. If noise with this loud dispersion changes for every second [a maximum of]it will be thought that there is no nature and it is hard to hear it.
[0015]Since processing of a base station side will be increasedgenerating the random remainderwhenever it generates a background noise cannot say that it is not much efficient.
[0016]Irrespective of the background-noise information transmitted intermittentlyan object of this invention is to provide the false background-noise generation method which can generate the false background noise which is comfortable for an addressee.
[0017]
[Means for Solving the Problem]In a false background-noise generation method at the time of no talking over the telephone in a mobile transmittera false background-noise generation method of this invention generates a false background-noise signal in a base station side based on a received coding energy valuea coding reflection coefficient valueand remainder numerals of white noise established beforehand.
[0018]According to the false background-noise generation method of this inventionbased on a received coding energy valuea coding reflection coefficient valueand remainder numerals of white noise established beforehanda false background-noise signal is generated in a base station side. Since it is generated based on remainder numerals of white noise beforehand established in this generationthere will be little processing of a base station side and it will end.
[0019]A false background-noise generation method of this invention stores remainder numerals of white noise beforehand as a fileduring silentrepeats remainder numerals of this stored white noise successivelyreads themand generates a false background-noise signal.
[0020]When according to the false background-noise generation method of this invention remainder numerals of white noise are beforehand stored as a file and remainder numerals of this stored white noise read repeatedly one by one during silentA false background-noise signal is generableand there will be little processing of a base station side for generation of a false background noiseand it will end.
[0021]
[Embodiment of the Invention]Hereafterone gestalt of operation of this invention is explained.
[0022]Drawing 1 and drawing 2 are an outline lineblock diagram by the side of the mobile station of the mobile transmitter with which the false background-noise signal generation method of this invention is appliedand an outline lineblock diagram of a base station siderespectively. The portion related to this invention method is mainly shown in both the outlines lineblock diagram.
[0023]The mobile station side shown in drawing 1 is explained. The digital sound signal changed into digital data is supplied to the coding part 1and a digital sound signal is coded by the coding part 2. If a digital sound signal is supplied to an owner sound and the silence detection part 3 and the owner sound state is maintained for the audio signal in the

owner sound and the silence detection part 3when being detectednamelythe output of an owner sound and the silence detection part 3 -- ** owner sound -> -- if it is owner sound **the output sound numerals from the coding part 2 will be transmitted via the transmission-line encoder 6.

[0024]If the output of an owner sound and the silence detection part 3 is ** owner sound -> silent ** when an audio signal is detected from an owner sound state as having changed to the soundless state in an owner sound and the silence detection part 3 namelythe hangover section will be made to start and an audio code will be transmitted via the transmission-line encoder 6. If the output of an owner sound and the silence detection part 3 is ** silent -> silent ** if the soundless state is maintained for the audio signal in the owner sound and the silence detection part 3 when being detected namelyexcept when transmitting a POST signal periodically between hangoverstransmission of an audio code will be suspended.

[0025]At this timethe short burst signal of information is transmitted at worst which is needed for taking a synchronization. Although the frame (S-N) (S>=N) after a hangover section (length S frame) start sends an audio code to the transmission-line encoder 6 as it isThe remaining N frames are replaced by the reflection coefficient value before carrying out data smoothing of the reflection coefficient value before coding of an audio signal by collaboration with the parameter smooth sections 4 and the parameter storing part 5and smoothing the reflection coefficient value by which data smoothing was carried out. After coding this replaced reflection coefficient valueit sends to the transmission-line encoder 6 together with other numerals.

[0026]When transmitting a POST signal periodically after the end of the hangover section on the other handthe frame energy value and reflection coefficient value of an audio signal -- the collaboration with the parameter smooth sections 4 and the parameter storing part 5 -- smoothing -- and after carrying out equalizing processingin addition to a POST signalit sends to the transmission-line encoder 6 together with other numerals.

[0027]The frame energy and the reflection coefficient value which were outputted from the parameter smooth sections 4 for smoothing and equalizing processing which the frame energy value when transmitting next timeand the reflection coefficient value described above are sent to the parameter storing part 5. the output of an owner sound and the silence detection part 3 -- ** silent -> -- if it is owner sound **a PRE signal will be sent to the transmission-line encoder 6and it announces starting audio signal transmission beforehand.

[0028]Hereif it explains with operation of the multiplexer 61when being detected with ** owner sound -> owner sound ** based on the audio signalwith the detecting signal of ** owner sound -> owner sound **in the transmission-line encoder 6the multiplexer 61 carries out transmission-line codingand sends out the audio code coded in the coding part 2. When detected with ** owner sound -> silent ** based on an audio signal** owner sound -> with the detecting signal of silent **the multiplexer 61 is changedand with other numeralsin the transmission-line encoder 6the coding reflection coefficient value and the equalized coding frame energy value which were smoothed carry out transmission-line codingand sends it out. When detected with ** silent -> owner sound ** based on an audio signalwith the detecting signal of ** silent -> owner sound **the multiplexer 61 changesin the transmission-line encoder 6carries out transmission-line coding and sends out the audio code coded in the coding part 2.

[0029]More particularlybased on the operation flow of the mobile station transmitting side in the silent interval shown in drawing 3 and drawing 4it explains later.
[0030]Nextthe base station side shown in drawing 2 is explained. An input signal is supplied to the separation circuits 9and takes out an audio codeand an owner sound and silent information by the separation circuits 9. If there is an output of only an audio signal from the separation circuits 9the switching part 14 will output an audio code. If there is an output of a POST signal from the separation circuits 9an audio code will be memorized to the storage parts store 10and a false background noise will be generated in a silent interval until a following POST signal or PRE signal comes.
[0031]The reflection coefficient value in which data smoothing was carried out to generation of the false background noise by the reflection coefficient value calculation part 11 is computedBy the remainder numerals file reading part 12 which has the memory which stored white noise remainder numerals as a file beforehand simultaneouslyremainder numerals are read and it sends to the false background-noise synchronizer 13 together with other numerals. The switching part 14 in a silent interval outputs the background-noise numerals from the false background-noise synchronizer 13. If there is an output of a PRE signal from the separation circuits 9a silent interval will be ended and the switching part 14 will output an audio code.
[0032]More particularlybased on the operation flow of the base station side in the silent interval shown in drawing 5it explains later.
[0033]Nextthe operation by the side of a mobile station is explained based on the flow church shown in drawing 3 and 4.
[0034]It is confirmed [an owner sound or] whether it is silent (Step S1)and an audio signal is coded and transmitted to the mobile station side until it is distinguished that it is silent (Step S2). When it is distinguished in Step S1 that it is silentthe hangover section is started (Step S3) and a coding frame energy value and the reflection coefficient value before coding are memorized (step S4). Usuallyeven if it detects a soundless state from an owner sound statetransmission of an audio code is not intercepted immediatelybut it is coded as an audio signal as it isand a several frame silent signal is transmitted so that the ending at the time of an owner sound state may not go out. This section is called the hangover section. Let the length of the hangover section be the S frame. A POST signal shall be transmitted every 50 frames during a silent interval.
[0035]When it is confirmed whether frame (S-N) progress was carried out (Step S5)it had not passed and it is distinguished following step S4it is coded as it is as an audio signaland an uncorresponded item is transmitted (Step S6). N is a natural number and N<=S. When having carried out frame (S-N) progress in Step S5 is distinguishedThe reflection coefficient value before the coding memorized in step S4 is read and smoothed (Step S7)The reflection coefficient value before the smoothed coding is before smoothingand is replaced by the reflection coefficient value before codingand after it codes this replaced reflection coefficient valueit is transmitted together with other numerals (Step S8). Following Step S8it performs again from step S4 until it carries out S frame progress (step S9).
[0036]When having carried out S frame progress is distinguished in step S9Thenwhen it is confirmed whether the non-sound is continuing (Step S10)the non-sound was not continuing after hangover section progress and it is distinguisheda ****** audio signal is just coded and transmitted to Step S10 (Step S11). When the non-sound was continuing

in Step S10 and it is distinguishedData smoothing of a coding frame energy value and data smoothing of the reflection coefficient value before coding are performed (Step S12)The reflection coefficient value before the coding which was replaced by the coding frame energy value before the smoothed coding frame energy value smoothingwas replacedand was smoothed by the reflection coefficient value before the reflection coefficient value before the coding smoothed further smoothingand was replaced by it is coded (Step S13).

[0037]The audio signal coded in Step S13 is transmitted with the 1st postamble signals (Step S14)When it is confirmed whether a next frame is also silent (Step S15)it was not silent and it is distinguisheda preamble signal is transmitted (Step S16)and it performs from Step S1.

[0038]When it is distinguished in Step S15 that it is silentafter the last postamble signal is transmitted (50-M)it is confirmed whether frame progress was carried out (Step S17). M is a natural number and is M<=S (S is a frame number of the hangover section). When frame (50-M) progress had not been carried out in Step S17 and it is distinguisheda short burst signal is transmitted following Step S17a synchronization is takenand it performs again from Step S15 (Step S18).

[0039]When having carried out frame (50-M) progress in Step S17 is distinguisheda coding frame energy value and the reflection coefficient value before coding are memorized (Step S19). It is confirmed whether 50 frames passed after the last postamble signal's transmitting following Step S19 (Step S20)When 50 frames had not passed in Step S20 and it is distinguisheda short burst signal is transmitted following Step S20a synchronization is takenand it performs again from Step S15 (Step S21).

[0040]When it is distinguished that 50 frames passed in Step S20Data smoothing of a coding frame energy value and data smoothing of the reflection coefficient value before coding are performed (Step S22)It is replaced by the coding frame energy value before the smoothed coding frame energy value smoothingIt is replaced by the reflection coefficient value before the reflection coefficient value before the coding furthermore smoothed smoothingThe signal which was coded (Step S23) and coded in Step S23 is transmitted with the following postamble signal together with other numeralsand the reflection coefficient value before the coding smoothed and replaced is continuously performed again from Step S15 (Step S24).

[0041]Nextsmoothing and equalizing processing are explained in detail. Firstin advance of smoothing and explanation of equalizing processingthe VSELP code currently used in mobile communications for voice coding and decryption is explained.

[0042]1 The VSELP code has the speech information of a first-sound voice frame. The length of a first-sound voice frame is 160 samples (20msec)and there are 50 frames in 1 second. Furthermorea first-sound voice frame is divided into four subframes (5msec). the following table 1 is a parameter numerals list of VSELP codes -- R -- frame energy -- softin -- a soft interpolation bit -- ri -- a reflection coefficient -- Lj -- the lug of the j-th subframe -- Ij -- the remainder of the j-th subframe -- gj -- the j-th subframe [GSPO] are shown.

[0043]

[Table 1]

[0044]Hereafterk considers it as the background-noise renewal period number in the - silent intervaland t is taken as the frame number of each background noise in a cycle. (1) During the - silent intervalformulas are numerals of the background noise which transmits the k-th cycle eye with a mobile station and by which data smoothing was carried outand are shown by (3) types. (2) During the - silent intervalformulas are numerals of the background noise of the t-th frame generated after receiving the k-th cycle eye in a base stationand are shown by (4) types.
[0045]
[Equation 1]

[0046]
[Equation 2]

[0047]
[Equation 3]

[0048]
[Equation 4]

[0049]Hereit is i= 1-10 and j= 0-3. k and t change with the length of a silent intervaland length of the transmission period of a mobile station. A silent interval is 5 secondsand when the transmission period of a mobile station is 1 secondit is k= 1-5 and t= 1-50. The operating sequence of an example of the transmitting side of a mobile station is shown in drawing 6. Transmission of said k-th cycle eye is hereafter indicated to be also the k-th mailbox signal transmission.
[0050]The owner sound section ends an example shown in drawing 6and it has the smooth section of a front N frame which passes the hangover section of the S frameA silent interval continued after the hangover section1st POST signal was sent out to the 1st following the hangover section2nd POST signal was sent out after sending out 1st POST signal at the time of the 50th frameand a case where it goes into the owner sound section after k times POST signal sending out equally below is illustrated.
[0051]Nextamendment of a reflection coefficient value by which a reflection coefficient value before coding in the hangover section by the side of a mobile station was smoothed and coded is explained. Amendment of a reflection coefficient value by which a reflection coefficient value before coding in the hangover section by the side of a mobile station was smoothed and coded is smoothing and amendment in a portion of the section a of drawing 7. In order to make audio frequency distribution in the hangover sectionand frequency distribution of a false background noise in a silent interval continue smoothlyin the hangover sectiondata smoothing of a reflection coefficient value before coding is performed.
[0052]As opposed to the N (N<=S) frame which remained after transmitting an uncorresponded item of a frame as an audio signal after a hangover section start (S-N)A

reflection coefficient value before coding by which data smoothing was carried out by performing data smoothing in a reflection coefficient value before coding as shown in the following (5) types is replaced by a reflection coefficient value before data smoothing is carried out.
[0053]
[Equation 5]

[0054](5) In a formulait is n=(N-1) -0 and i= 1-10. ri (S-n) is the i-th reflection coefficient value before coding of a ** (S-n) frameand ri (S-n-1) is the i-th reflection coefficient value before coding of the frame of one frame ago from (S-n).
[0055]Smoothing by the above-mentioned (5) types is replaced by the reflection coefficient value before smoothing the continuous reflection coefficient value of two framesand the smoothed reflection coefficient value smoothing it. These processings are processings of the reflection coefficient value before codingthis reflection coefficient value smoothed and replaced is codedand a part for a frame (N-1) is transmitted. In this caseit may smooth about the reflection coefficient value before continuous coding of two or more frames.
[0056]Nexta reflection coefficient value before coding is similarly smoothed about the frame ri of the last of the hangover section (S)it is replaced by a reflection coefficient before a reflection coefficient value before this smoothed coding smoothingand this reflection coefficient value smoothed and replaced is coded. Processing like [value / r1 / (S) / in this coded reflection coefficient value / 1st reflection coefficient] (6) types shown below is performed.
[0057]
[Equation 6]

[0058]To namelythe 1st reflection coefficient value r1 in the coded reflection coefficient value (S). rl(S) =rl (S) About the reflection coefficient value by which amendment of **1 or 2 [**] was performedand it was coded other than the coded 1st reflection coefficient valueit does not amend but the amended 1st reflection coefficient valueand the 2nd which is not amended - the 10th reflection coefficient value are transmitted.
[0059](5) ri (S-n) of a formula is a reflection coefficient value before codingand although it is a fractional value (-1<ri(S-n) <1)rl (S) of (6) types is the coded 1st reflection coefficient value -- it is (0 <=rl (S) <=31). Heresince it was coded by 5 bitsthe 1st reflection coefficient value was restricted with 0 <=rl(S) <=31. The reason for processing of (6) types is explained briefly. The reflection coefficient value has audio frequency information. Especially the 1st reflection coefficient value has most amount of information. Audio frequency is so low that the value of this symbolic language is smalland audio frequency is so high that the value of a symbolic language is large. Since it is hard to hear it even if too high [frequency is too lowand]the 1st reflection coefficient value by which the frame of the last of the hangover section described as the signal when transmitting the POST signal of each time in the silent interval described later here was coded is amended like (6) types.
[0060]Nextsmoothing of a coding frame energy value of a mobile station in a silent

interval is explained.
[0061]Smoothing of a coding frame energy value of a mobile station in a silent interval is equalization of a coding frame energy value in the section illustrated at the sections d and e in drawing 8for example. An audio frame number when transmitting k-th POST signal with a mobile station is set to mk during a silent interval. A coding frame energy value which transmits with k-th POST signal is expressed as (7) types. (7) In order to compute a coding frame energy value displayed by a formulacalculate average value {R(k) AVR} of a coding frame energy value to a frame (mk-M-1) which traced back the M frame from the mk frame first by (8) types.
[0062]
[Equation 7]

[0063]
[Equation 8]

[0064]When transmitting k-th POST signal{average value R (1) AVR} of a coding frame energy value and the average which were further computed by (8) formulas in the average value {R(k) AVR} of the coding frame energy value are takenand this average value is set to {R'(k) AVR}. The value in this case is calculated by (9) types. The average value of a coding frame energy value when transmitting 1st POST signal serves as {R'(1) AVR =(2andR(1) AVR / 2) =R(1) AVR}.
[0065]
[Equation 9]

[0066]If the value after deducting p (k) shown in Table 2 from the average value {R'(k) AVR} of a coding frame energy value is expressed as (10) typesthis value will be calculated by the operation of (11) types. When the value calculated by (11) types is less than zerothe value of (11) types is set to 0.
[0067]
[Table 2]

[0068]
[Equation 10]

[0069]
[Equation 11]

[0070]Thenthe coding frame energy value which transmits next it is shown in (13) types is amended using the coding frame energy value which transmitted last time which is shown by (12) formulas.

[0071]
[Equation 12]

[0072]
[Equation 13]

[0073]The difference of the value of (12) types and the value of (13) types is first searched for by (14) types for amendment of the coding frame energy value which transmits.
[0074]
[Equation 14]

[0075](14) When an absolute value of difference deltaR (k) for which it asked by the operation of a formula is larger than 1calculate an energy value which is shown by the aforementioned (7) formula and which transmits by (15) formulas.
[0076]
[Equation 15]

[0077](14) When the absolute value of difference deltaR (k) for which it asked by the operation of the formula does not exceed 1calculate the energy value which is shown in the aforementioned (7) formula and which transmits by (16) formulas.
[0078]
[Equation 16]

[0079](14) When calculating the coding frame energy value which transmits with 1st POST signal by the operation of a formulaThat iswhen calculating deltaR (1) at the time of (k= 1)the coding frame energy value at that time {= average value R(k) AVR} is used as an initial value of the coding frame energy value shown by (17) formulas. That isit is considered as the value of (18) types.
[0080]
[Equation 17]

[0081]
[Equation 18]

[0082]The average value of the coding frame energy value calculated by the above is replaced by a coding frame energy value by that in coded voice signal dataand the coded voice signal data in which this substitution was made is transmitted.
[0083]All data smoothing of the above-mentioned frame energy value is processings of a

coding frame energy value. So that clearly from the above-mentioned (9) types(11) types(14) types(15) typesand (16) types in this example. It is amended by the coding frame energy value which the average value of the coded coding frame energy value calculatesand can be set at the time of the last transmission with a direct coding frame energy value of the calculated average value which was codedDispersion becomes smalland also the energy value which carries out each time transmission during the - silent interval will carry out steps attenuationand becomes easy to hear a false background noise. In the usual statethe average value of the coding frame energy value calculated and transmitted to the beginning of the silent interval is not exceededand the average value of the coding frame energy value transmitted immediately before is not exceeded. Dispersion becomes smalland also the energy value which carries out each time transmission during the - silent interval by the above processing will carry out steps attenuationand becomes easy to hear a false background noise.
[0084]Nextsmoothing of a reflection coefficient value of a mobile station in a silent interval after an end of the hangover section is explained.
[0085]In this casealso in drawing 7it is data smoothing of a reflection coefficient value in the sections b and cand an audio frame number when transmitting k-th POST signal with a mobile station is set to mk during a silent interval like a case of processing of a coding frame energy value of a mobile station in a silent interval.
[0086]In order to calculate a reflection coefficient value before coding displayed by following the (19) formula when transmitting k-th POST signalAverage value of the reflection coefficient value ri (i= 1-10) before coding shown by (20) formulas to a frame (mk-M-1) which traced back the M frame from the mk frame first is calculated by (21) types. M is a natural number of M<=S here.
[0087]
[Equation 19]

[0088]
[Equation 20]

[0089]
[Equation 21]

[0090]The transmission value shown by the aforementioned (19) formula when transmitting with k-th POST signal by (23) types is calculated using the reflection coefficient value before the coding shown by (22) formulas which transmitted the average value {ri(k) AVR} of the reflection coefficient value before codingand last time.
[0091]
[Equation 22]

[0092]
[Equation 23]

[0093](23) The reflection coefficient value ri (m1-1) before coding of the last of the hangover section is used for the initial value of (22) types used when calculating the reflection coefficient value before the coding shown by (24) formulas which transmit with 1st POST signal by a formula. That isit is like (25) types.

[0094]

[Equation 24]

[0095]

[Equation 25]

[0096](23) Explain how to decide the coefficients a and b (positive integer which a and b defined beforehand) in a formula. Since a former transmission value will be thought as important if the coefficient b is set up somewhat more greatly than the coefficient adispersion in a value of (23) typesi.e.a reflection coefficient value before codingbecomes small. A reflection coefficient value before coding smoothed by the above-mentioned processing is replaced by a reflection coefficient value before coding.

[0097]Nextonly a value of the coded 1st reflection coefficient value which is shown by (27) formulas in a coding reflection coefficient value currently displayed by (26) formulas is amended as shown in the following (28) types.

[0098]

[Equation 26]

[0099]

[Equation 27]

[0100]

[Equation 28]

[0101](21) The reflection coefficient value (ri (mk-h)) in a formula and the reflection coefficient value (reflection coefficient value shown by the following (29) formulas) in (23) types are reflection coefficient values before codingand although it is a fractional value(30) types in (28) types are the coded reflection coefficient valuesand are a value of the range shown in (31) types. This range is because the 1st reflection coefficient value is coded by 5 bits. [0102]

[Equation 29]

[0103]

[Equation 30]

[0104]
[Equation 31]

[0105]Hereit summarizes about processing of the reflection coefficient value in the silent interval after a hangover period passes. As for the reflection coefficient value sent out with k-th POST signalthe reflection coefficient value before coding of each frame in front of the M frame is first equalized from k-th POST signal. The reflection coefficient value before coding of each frame in front of the M frame is equalized from the ** (k-1) time POST signal searched for like the reflection coefficient value before the equalized coding. The reflection coefficient value before this the equalized coding of both is weight averaged. It is replaced by the reflection coefficient value (for examplething to the reflection coefficient value transmitted with the POST signal of the k-th time) before the reflection coefficient value (for examplething to the reflection coefficient value transmitted with the POST signal of the k-th time) before this coding weight averaged is codedThe replaced reflection coefficient value is coded.
[0106]The coded 1st reflection coefficient value in a coded reflection coefficient value is replaced by a coded reflection coefficient value before amendment by (28) types is carried out and being amended. A compensation process is not made to the 2nd coded - the 10th reflection coefficient value. This is because the 1st reflection coefficient value occupies the biggest weight among other reflection coefficient values.
[0107]1st POST signal is sent out following an end of a hangover period at the time of the first framei.e. (S+1)a frame. In this caseparts for the M frame including a reflection coefficient value before a frame in the overhang section is coded are averaged. As shown in (25) types when smoothinga reflection coefficient value of the last of the hangover section is used as an initial value.
[0108]Nextgeneration of a false background noise of a base station is explained based on a flow chart of drawing 5.
[0109]In a base stationit is confirmed whether to be having received an audio signalwhen a signal is received (Step S30)and when it distinguishes that it is an audio signalafter an audio signal is outputted following Step S30it performs again from Step S30 (Step S31). A kind of signal is distinguishedwhen it was not an audio signal in Step S30 and distinguishes (Step S32). When it is distinguished that it is a PRE signal in Step S32an audio signal is outputtedand it performs again from Step S30 continuously (Step S33).
[0110]When it is distinguished that it is a POST signal in Step S32an audio signal is memorized (Step S34) and a reflection coefficient value is calculated (Step S35). When it is distinguished that it is a short burst signal in Step S32Step S34 is skippedand Step S35 is performed.
[0111]After remainder numerals of white noise beforehand stored in a memory as a file are read following Step S35 (Step S36)a false background-noise signal is compounded (Step S37) and a false background-noise signal is outputtedit performs again from Step S30 (Step S38).
[0112]Nextgeneration of a false background noise in a base station is explained in detail.
[0113]A base station during a silent interval A POST signal of the next after receiving k-

th POST signalOr VSELP numerals (= (3) type) shown by (32) formulas of a background noise inputted with a POST signal and remainder numerals of white noise prepared for a memory as a file beforehand are used during the section until a PRE signal comesVSELP numerals (= (4) type) displayed by (33) formulas of a false background noise are compounded.

[0114]

[Equation 32]

[0115]

[Equation 33]

[0116]In order to give the feature of a actual background noise to a false background noisethe energy value displayed by (36) formulas of the background noise which received is used for the frame energy value displayed by (34) formulas. After the reflection coefficient value and base station which are displayed on the reflection coefficient value displayed by (35) formulas by (37) formulas which received receive last timeit is computed using the reflection coefficient value (48) type of the frame of the computed last. In order to give random nature to a false background noisethe remainder numerals displayed by (38) formulas use the remainder numerals of the VSELP code displayed by (39) formulas generated by white noise. (40) Make into a constant the gain displayed by a formulaand set to 0 the lug displayed by (41) formulas.

[0117]

[Equation 34]

[0118]

[Equation 35]

[0119]

[Equation 36]

[0120]

[Equation 37]

[0121]

[Equation 38]

[0122]

[Equation 39]

[0123]
[Equation 40]

[0124]
[Equation 41]

[0125]If the above-mentioned relation is shownit will become like a (42) type and (44) type - (47) type. As sofin is shown in (43) typesit is set as value **1**.
[0126]
[Equation 42]

[0127]
[Equation 43]

[0128]
[Equation 44]

[0129]
[Equation 45]

[0130]
[Equation 46]

[0131]
[Equation 47]

[0132](t/k) in each above formula puts the t-th false background-noise frame that the base station generated after the k-th reception. (44) (48) types in a formula are the reflection coefficient values of the frame of the last computed after the base station received last time. (44) Having displayed that it set in a formula (50-t)the transmission period of a mobile station is because a base station needs to generate the pseudonoise of 50 frames in 1 second in 1 time of a case. The initial value displayed by (50) formulas used when a base station calculates (49) types by (44) formulas after 1st POST signal reception is a reflection coefficient value of the frame of the last of the hangover section. That isit is as (51) types.
[0133]
[Equation 48]

[0134]
[Equation 49]

[0135]
[Equation 50]

[0136]
[Equation 51]

[0137](47) U in a formula is prescribed by the standards of Research & Development Center for Radio System. [GSPO] It is an index number of a code book. How to decide the following U is explained. The gain gamma for determining the loudness level of the weighting composing device specified by the standards of Research & Development Center for Radio System is calculated by (52) formulas. (52) GS in a formulaand PO [GSPO] It is an ingredient of the vector chosen from the code book.
[0138]
[Equation 52]

[0139][GSPO] If Tu shown in (53) types is calculated to the index number (u= 0-127) of a code bookthe influence which each index number u has on the size of the gain gamma is known. When making the gain gamma into the maximum to a false background noiseTu should just choose u (=113) which becomes the maximum. If the gain gamma is made smallit can be considered as the size of a request of the loudness level of a false background noise by Tu's becoming smallfor examplechoosing it as u (=75).
[0140]
[Equation 53]

[0141]the remainder numerals (the following (54) types) of the VSELP code of white noise -- beforehand -- for examplethat is prepared for the remainder numerals file of white noise for 5 seconds (250 frames). When generating a false background noiseif the remainder numerals file of white noise is read in an order from a head and it endsit will read from a head again.
[0142]
[Equation 54]

[0143]
[Effect of the Invention]As explained aboveby performing equalizing processing of the frame energy value of a mobile stationand a reflection coefficient valuedata

smoothingand data smoothing of the reflection coefficient value of a base station according to this invention method. The effect of becoming renewable [the sound where the audio size and height of a false background noise in all the silent intervals become that it cannot be easily influenced by dispersion in the background-noise signal in the transmitting time of each cycle and which is comfortable] is also acquired.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of one example showing the outline composition of the sending circuit of the mobile station with which this invention method is applied.
[Drawing 2]It is a block diagram of one example showing the outline composition of the receiving circuit of the base station where this invention method is applied.
[Drawing 3]It is a flow chart with which explanation of an operation of this invention is presented.
[Drawing 4]It is a flow chart with which explanation of an operation of this invention is presented.
[Drawing 5]It is a flow chart with which explanation of an operation of this invention is presented.
[Drawing 6]It is a ** type explanatory view of the owner sound section and a silent interval with which explanation of an operation of this invention is presented.
[Drawing 7]It is a ** type explanatory view for explanation of smoothing of the reflection coefficient value in this invention.
[Drawing 8]It is a ** type explanatory view for explanation of equalization of the coding frame energy value in this invention.
[Drawing 9]It is a block diagram showing the composition of the sending circuit by the side of the mobile station of a conventional exampleand a receiving circuit.
[Description of Notations]
2 Coding part
3 An owner sound and a silence detection part
4 Parameter smooth sections
5 Parameter storing part
6 Transmission-line encoder
9 Separation circuits
10 Parameter storing part
11 Reflection coefficient value calculation part
12 Residual signal file reading part
13 Pseudonoise synchronizer
14 Switching part
61 Multiplexer